

Incentive regulation, benchmarking and utility performance

Utility Regulators Forum discussion paper

Prepared for the Utility Regulators Forum by:
Robert Albon
Senior Economic Adviser (Regulatory)
Australian Competition and Consumer Commission
Level 35, The Tower
Melbourne Central
360 Elizabeth Street
Melbourne Vic 3000

Email: robert.albon@accc.gov.au

November 2000



© Australian Competition and Consumer Commission 2000

ISBN 0 642 40272 8

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968* no part may be reproduced by any process without permission from the Australian Competition and Consumer Commission. Requests and inquiries concerning reproduction and rights should be addressed to the Director Publishing, ACCC, Dickson ACT 2602.

Disclaimer

The Utility Regulators Forum was established in recognition of the need for cooperation in a federal system among national and State-based regulators. The forum consists of regulators operating in industries where utilities that traditionally operated as monopolies are being opened up to competition as a result of the competition reform process. By acting as a focal point for regulators in different jurisdictions the forum will:

- ✍ foster understanding of issues and concepts faced by regulators on similar industries;
- ✍ minimise overlap of regulations for large users who operate across jurisdictions;
- ✍ provide a means of exchanging information; and
- ✍ enhance the prospects for consistency in the application of regulatory functions.

The following paper does not necessarily represent the views of the members of the forum, but is released by the Utility Regulators Forum to encourage discussion in a range of important regulatory issues.

This paper was prepared for the Utility Regulators Forum by Robert Albon, formerly of the Department of Economics, Faculty of Economics, Australian National University and now Senior Economic Adviser (Regulatory), ACCC. An earlier version of the paper with the title, 'The role of benchmarking in incentive regulation', was presented to the forum in Adelaide on 13 July 2000 and a preliminary version (dated 10 March 2000) was circulated to the members of the forum for comment. The author is grateful for comments at the different stages, but takes sole responsibility for the contents.

Contents

Background	1
Performance measurement	4
Introduction.....	4
Productivity.....	4
Partial productivity.....	4
Total factor productivity (TFP).....	5
Data envelopment analysis (DEA).....	5
Stochastic frontier analysis.....	5
Productivity measurement in electricity.....	6
Pricing.....	6
The overall price level.....	6
The structure of prices.....	6
Pricing in electricity.....	7
Financial viability.....	7
Service quality.....	7
Approaches to regulation	9
Introduction.....	9
Incentive regulation.....	10
Independence.....	10
Rate-of-return (or cost-of-service) regulation	11
Price and revenue capping — origins and objectives	13
Implementation problems of CPI? X	15
Establishing the initial situation.....	15
Extent of initial cost recovery.....	15
Extent of cost inefficiency.....	17
Inefficiency of the structure of prices.....	17
The setting of X.....	17
The regulatory period (re-setting X) and the ‘glide path’.....	17
Service quality.....	18
Overall assessment.....	18
Yardstick regulation	20
Conclusions	21
Performance measurement and regulation are related.....	21
Performance measurement is difficult but advancing.....	21
Pricing structure is important.....	21

Incentive regulation, benchmarking and utility performance.....	iii

Not all regulation is incentive regulation.....	21
Cap prices not revenue	22
Importance of X.....	22
Timing of regulatory re-sets is important.....	22
WACC and DORC are difficult to avoid	22
Yardstick regulation is informationally demanding.....	23
References	24
Contacts	28

Background

Since the 1980s Australia has undertaken a major process of utility reform at both national and State levels. Increasing evidence — including from international benchmarking studies — of poor utility performance in key areas such as telecommunications, transport, water, gas and electricity led to the ensuing reform process in the organisational, management and ownership structures of utilities; and partially opened them up to competition. In turn, these changes both necessitated and have been accompanied by substantial changes in the form and structure of regulation applied.

Aspects of regulatory design are keenly debated by the regulators and the regulated in all utility areas, and the electricity industry is no exception. For example, in the case of the privately owned Victorian electricity distribution businesses (DBs), the regulatory structure to apply from 2001 was the subject of lively discussion. The Victorian Office of the Regulator-General in its detailed consultation paper suggested certain desirable characteristics for the regulatory regime commencing in 2001.

- ✍ The introduction of a ‘CPI-X’ incentive-based regulatory methodology and explicitly not rate-of-return regulation (Office of the Regulator-General 1998, p. 5).
- ✍ Adoption of a ‘forward-looking regulatory stance’ (ibid., p. 6).
- ✍ Setting X on the basis of both ‘licensee-specific benchmarks which compare the performance of individual licensees over time and of different licensees at a given time’ and ‘more general benchmarks which provide industry and economy-wide indicators of best practice performance’ (ibid., p. 6).
- ✍ Finding the ‘right balance’ between incentives to improve efficiency and the sharing of rewards between investors and customers (ibid., p. 6).
- ✍ Making a distinction between controllable and windfall efficiencies (ibid., pp. 6–7).
- ✍ Establishment of standards of service quality and reliability with an associated penalty and reward system (ibid., p. 7).
- ✍ The building-up of revenue benchmarks based on the need to cover ‘a return on the depreciated value of past capital investments ... depreciation; efficient operating costs and a reward for past efficiency gains’ (ibid., p. 8). A specific weighted average cost of capital (WACC) will be determined for each business depending on its specific risk characteristics.

The DBs, aided by Christensen Associates/Pacific Economics Group (PEG), have advocated the expansion of the role of ‘productivity benchmarking’ and ‘performance-based rate-making’ as factors in regulation. In particular, the Christensen/PEG authors, Kaufmann and Lowry (1998, pp. 60–1; 2000, pp. 42–55) advocate:

- ✍ **X based on TFP.** The industry's long-term total factor productivity (TFP) should be the basis for setting X in a CPI?X regulatory regime. The so-called 'building blocks' approach — based on the utility's projected operating and capital costs — is rejected.
- ✍ **Benefit sharing.** When the utility does better at reducing costs than rate X, there must be a mechanism for sharing these benefits.
- ✍ **Quality by incentives.** Quality standards should be based on what consumers are willing to pay for them and should be assured by providing appropriate incentives to meet them.

National Economic Research Associates (NERA) (Shuttleworth 1998; Makhholm 1999) have taken exception to a number of aspects of the Christensen/PEG approach, and a rather excited exchange proceeded between the two groups of consultants. In my view this exchange produced more heat than light.

The New South Wales Independent Pricing and Regulatory Tribunal (IPART) has produced a paper that discusses the 'principles for sharing the benefits of efficiency gains, and the impact regulation has on incentives for a utility' (1999a, p. 1), specifically in relation to electricity network service providers (NSPs). While it claims to provide some preliminary recommendations, these are well hidden within the comprehensive review. IPART's paper is a decidedly less conclusive document than that of the Office of the Regulator-General (ORG). However, it is possible to distil some dot points summarising what appears to be IPART's position on desirable characteristics of the regulatory regime:

- ✍ prices or revenues should be regulated, not profits (1999a, p. 3);
- ✍ controls should extend over several years (*ibid.*, p. 3);
- ✍ the utility should be able 'to retain the benefits of improved profitability for a period of time' (*ibid.*, p. 4);
- ✍ whatever 'principle is adopted [with respect to windfall profits and losses] should be applied equally to variations in either direction' (*ibid.*, p. 5);
- ✍ 'As far as possible, the rules, procedures and supporting formulae should be comprehensible, implementable and capable of responding to all reasonable scenarios' (*ibid.*, p. 18);
- ✍ the 'use of error correction methods for mid-review adjustments does not appear to be justified' (*ibid.*, p. 20); and
- ✍ a 'cost linked, with glide path ... option appears at this stage to offer the best balance of benefits and risks' (*ibid.*, p. 29).

The purpose of this paper, consistent with the terms of reference, is threefold.

- ✍ There is the aim of reviewing and evaluating the objectives and methods of measuring utility performance; particularly with respect to benchmarking and ‘yardstick competition’, and in the context of the electricity industry.
- ✍ The paper contains a review of the theoretical and practical aspects of different approaches to regulation (traditional UK departmental control, traditional US rate-of-return (or cost-of-service) regulation, price capping regulation and yardstick regulation) and considers the difficulties encountered in implementing and operating these regulatory regimes. Particular emphasis is on CPI-X. Regulatory approaches are assessed against efficiency criteria and in the light of the elements of best practice regulation identified by the Western Australian Office of Water Regulation (1999) for the Utility Regulators Forum and including consultation, predictability, consistency, accountability and transparency.
- ✍ The relationship between benchmarking and determining the parameters of CPI-X is discussed; particularly in the context of current regulatory debates (including regulation of the Victorian DBs and NSW NSPs) and in the light of experiences in other countries.

Performance measurement

Introduction

Before the start of utility reform in the late 1980s, productivity measurement in the utility area was either non-existent (e.g. in telecommunications) or sporadic and unsophisticated.¹ Utilities were usually not a good source of information. Particularly when subject to criticism about their performance, they typically become defensive and unwilling to divulge information. Further, primitive accounting systems often did not generate the sort of information required for full appraisals and independent assessments of utility performance were therefore necessary.

The task of performance measurement was carried out by various government bodies including the former Bureau of Industry Economics (BIE) (which conducted a series of international benchmarking studies of all major utility areas), the Industry/Productivity Commission, the Bureau of Transport Economics (BTE) and various State regulatory bodies.

Performance appraisal of utilities has a number of dimensions. Most particularly, these are productivity; pricing (level and structure); financial viability and service quality, which will be considered in turn.

Productivity

Productivity is a measure of how good the producer is at turning inputs into outputs; and is usually defined in the form of a ratio of output(s) to input(s). Productivity can be measured on a partial or a total basis. There are severe measurement difficulties on both the output side and the input side; especially as most utilities produce multiple outputs and all use multiple inputs.

Partial productivity

This approach relates some measure of output to the quantity of a single input, such as the number of customers per employee or passenger kilometres flown per employee. While simpler to measure than total factor productivity (TFP) (considered below), partial productivity measures have less clear meaning. The main difficulties with partial measures are stated below.

✍ **Aggregated output:** often the output measure is highly aggregated over a host of heterogeneous outputs. Typical output measures are the total number of postal articles of all kinds carried, the total number of telephone calls made and the total number of passengers flown. Changes in the composition of the numerator are

1 While not dealing with a 'utility' as such, Michael Kirby's work on multi-product and multi-factor efficiency analysis of the Australian airlines is a notable exception (see Kirby (1986) and Kirby and Albon (1985)).

important to interpreting what has happened to output. For example, did an increase in the total number of telephone calls occur by an increase in the number of low-valued local calls or by an increase in the number of high-valued international calls? This suggests that some form of weighting of the different outputs is desirable.

✍ **Influence of other inputs:** an ‘apparent’ increase in productivity under partial measures could alternatively be explained by the increase in the use of another input, but this does not form part of the measure. For example, output per worker may go up because workers have more capital equipment to work with rather than because they are actually more productive.

✍ **Measure capacity not output:** sometimes the numerator in the productivity ratio is a proxy for output rather than actual output. For example, a common measure of telecommunications productivity is the number of exchange access lines per employee. While the qualified use of this measure can be defended, it is more a measure of capacity than of output.

Total factor productivity (TFP)

TFP promises a more conceptually pleasing result, but is fraught with practical difficulties. TFP indicators require aggregation of the utility’s outputs and inputs. The various outputs and inputs have to be weighted in some way. On the input side, heterogeneous labour and capital inputs have to be measured, weighted and aggregated. Most utilities have various types of capital equipment for a variety of purposes and this is comprised of various vintages and technologies. There are similar problems with respect to human capital.²

Data envelopment analysis (DEA)

DEA involves determining an efficiency frontier using linear programming techniques and uses a definition of how far a particular producer is from this frontier. If best-practice efficiency is normalised to a score of one, then the efficiency of particular producers can be gauged by how far they are from one. For example, a score of 0.85 indicates the producer is 15 per cent off best practice (or would need to increase its productivity by 17.6 per cent to achieve best practice).³

Stochastic frontier analysis

Stochastic frontier analysis is similar to DEA except that it allows an assessment of random effects on efficiency. A research paper prepared by the New South Wales IPART (1999c) contains a discussion of the stochastic frontier technique and compares

2 Waters and Street (1998, pp. 359–61) provide a concise discussion of what TFP is, make observations on its usefulness as a performance measure and list a number of key references.

3 Details of this approach and some of its applications are included in the review prepared for the Utility Regulators Forum by Malcolm Abbott (1999), National Economic Research Associates (NERA) (1996) and IPART (1999c).

it with DEA and TFP. These techniques are applied to the determination of Australian and international benchmarks for gas distributors.

Productivity measurement in electricity

There has been considerable work done on productivity measurement in the Australian electricity industry, including international and interstate comparisons of productivity levels. This work includes research by the BIE (1996), Lawrence (1998) and the London Economics study commissioned by IPART (1999b). Much of this literature has been reviewed as part of Malcolm Abbott's paper for the Utility Regulators Forum. The broad conclusions of these studies are that:

- ✍ overall TFP in Australian electricity has been growing — slowly from the late 1970s to 1985 and more rapidly since;
- ✍ overall TFP and DEA scores in Australia are well below those in the United States, although the gap appears to be narrowing;
- ✍ there are substantial differences between the productivity performance of electricity distributors across the Australian States whether measured by TFP or DEA — differences are, however, less evident with DEA analysis taking into account factors (like the proportion of customers that are domestic and customer density) beyond the control of management.

Pricing

The overall level of prices (influenced by productivity and the extent to which monopoly power is exercised) and the structure of pricing are important efficiency indicators.

The overall price level

The overall level of prices is related to overall productivity (considered above) and the degree of cost recovery (considered under Financial viability) so it is not discussed further in this subsection.

The structure of prices

Pricing structure is also an important efficiency concern. Efficiency of pricing involves relating use of services to long-term marginal cost and retrieving unassigned costs from customer access charges set so as not to exceed any user's economic surplus. Where use prices have to deviate from long-term marginal cost, deviations should be on the basis of the Ramsey–Boiteux rule where those services with least elastic demands (accounting for cross-market effects) are exploited most (Baumol and Bradford 1970). A utility can perform poorly by having an individual service price either too high or too low relative to cost, or it may have an inefficient mix of revenue coming from access and service prices (usually relatively too much from service prices).

Pricing in electricity

There is evidence of substantial pricing inefficiency in the Victorian electricity industry. For example, ORG (1998, pp. 47–8) reports ‘customers who, on the face of it, are currently paying tariffs above the standalone cost of providing a distribution service’ and ‘an inappropriate balance of revenue being recovered from one customer class relative to another, between one location and another and, potentially, between the fixed and variable elements of distribution tariffs for some customer classes’.

Financial viability

The extent of financial viability is another performance indicator for utilities. The degree of cost recovery, measures of profitability and rates of return are important considerations in assessing utility performance, but have to be carefully interpreted in the light of a large number of other factors. In the private sector a better bottom line is usually an indication of better performance. This is not necessarily the case for utilities although might be in a wide range of circumstances because indicators of financial viability are influenced by both revenue and cost phenomena. An improvement in financial performance could involve various combinations of changes in revenues and costs. For example, profitability could increase if costs rose less than revenue or revenues fell less than costs.

If an improvement in profitability reflects an increase in revenues with no change in expenses, it could either be good or bad. Where prices are initially too low to achieve cost recovery, increases in prices up to the cost recovery level reflect greater efficiency. On the other hand, where prices are initially too high (that is, where the rate of return on capital is above the WACC), increases in prices reflect monopoly abuse and therefore indicate a lessening of efficiency.

Improvements in financial viability that flow from cost reductions resulting from productivity improvements unambiguously reflect efficiency gains, although the gains would be higher if the cost reductions were passed on in lower prices in the context of initial over-pricing. The financial result also has to be considered in the light of service quality.

Service quality

Aspects of service quality include the quality of the product itself and various indicators of reliability. Examples of the quality of the service per se include postal delivery standards (time between posting a letter and its delivery), water quality (purity of the water delivered to households) and voice clarity in telephony (clarity of the telephone call). Issues of reliability and service response times are reflected in such things as frequency and length of electricity blackouts and of sewer chokes.

Quality issues have been an important part of debates about utility reform in the past fifteen or so years and the reform process has been associated with the development of a variety of service quality measures for the various utility areas. However, in considering service quality issues it should be recognised that the highest possible

quality of service is not necessarily the most efficient. Better service involves higher cost and there is a clear trade-off between service quality and cost (price). Not all consumers are prepared to pay the price of 'Rolls Royce' levels of service. Even if utility reform comes at the expense of service quality — and there is no strong evidence that it does — it does not necessarily reflect a diminution in performance. Rather it may reflect a closer matching of consumer demands and utility supplies.

Approaches to regulation

Introduction

Many of Australia's political, legal and economic institutions were established in the colonial period and were based on those of Great Britain. Of particular relevance here is that Australia assumed that country's organisational structure for utility operations featuring government ownership, statutory monopoly, vertical integration and bureaucratic operation within a government department. The associated traditional forms of utility regulation existing at the time the reform process began were direct and highly prescriptive; often combining regulatory and operating functions within the department. Further, it often involved elements of direct ministerial control.⁴

There were several reasons for the demise of the old structure.

- ✍ Fundamentally **it did not work very well**. It was not conducive to, and did not provide, appropriate incentives for the utility to strive for increased cost efficiency and neither allowed nor encouraged the adoption of more efficient pricing structures. These direct forms of regulation were usually highly politicised, resulting in inefficient pricing structures (e.g. holding politically sensitive prices below cost of provision and, in most cases, placing too much weight on use charges as opposed to customer access charges). Often the pricing structure also failed to achieve full cost recovery.
- ✍ Changes in the form of organisational and management structures of utilities (corporatisation) invite changes in the form and structure of regulation. Indeed, **regulatory reform is part and parcel of corporatisation**. Reducing the scope for political interference and establishing a clear corporate focus are integral parts of corporatisation and can only be achieved by the separation of operational and regulatory functions; placing responsibility for the latter in an independent body.
- ✍ After stage-one utility reforms, the corporatised utility remains a statutory monopoly but one with greater incentive to exploit its monopoly position. This invites regulation to **prevent the exercise of monopoly power**, often interpreted as requiring that the rate of return on capital is no greater than the WACC.
- ✍ When, as is usually the case, the corporatised utility begins its new life with an inefficient pricing structure, the introduction of more indirect and incentive-based regulatory forms provides both a means and a motive for management to **'rebalance' prices towards assigned service costs**. It also allows greater use of customer access prices.

4 See Abraham (1994, pp. 76–81) for an excellent discussion and appraisal of regulation of pricing in Australian telecommunications before the start of corporatisation in the late 1980s.

✍ Most utility reform programs do not stop with corporatisation; moving on to relaxation of statutory monopoly and, in many cases, to some form of privatisation. The introduction of **greater competition gives rise to new challenges** and provides another reason for reforming regulation. In a competitive environment persisting with internal-to-the-utility regulation is like Dracula being in charge of the blood bank.

Incentive regulation

There is now considerable support for the idea of incentive regulation as against older and more intrusive regulatory approaches. The meaning of the term incentive regulation is not always made clear. It is sometimes argued by, for example, Stephen King at the November 1999 ACCC incentive regulation conference, that **all** regulations are incentive compatible. However, the distinguishing feature of incentive-compatible regulation is that it uses the carrot to achieve at least some of its objectives, while direct regulatory approaches use only the stick. Relevant objectives of utility regulation lie in improved operational efficiency through the pursuit of lower costs, attainment of more efficient pricing and maintenance of appropriate levels of service quality.

Of the regulatory schemes discussed in this paper, price capping and yardstick regulation both belong to the category of incentive regulation; while rate-of-return regulation does not. Whereas rate-of-return regulation may cause the utility to reduce productive efficiency (i.e. to **increase** its production costs) by using an excessive amount of capital equipment and usually dictates inefficient pricing structures, price capping and yardstick regulation both contain inducements for the utility to increase productivity in a quest for **lower** costs. Additionally, both can be devised to provide an incentive for the utility to move towards a more efficient pricing structure. However, all regulatory schemes involve some degree of enforcement (stick). In particular, service quality standards are generally maintained by a system of penalties for not complying.

Independence

A feature of Australian utility reform has been a move towards independent regulators that see themselves as independent of both government and the utilities they regulate. However, in practice, governments are reluctant to grant complete freedom of price adjustment within the cap. They prefer a 'dirty' price cap (reminiscent of the 'dirty float' of exchange rates) and sometimes favour an X (see below) which is too far on the side of customers to be compatible with maximum efficiency gains. Restrictions on pricing adjustments are often in the form of sub-caps limiting the increase in particular prices (for example, limiting the increase in the price of a particular service to the increase in the CPI) to prevent politically unpalatable price restructuring. Other prices might be kept completely out of the cap's basket.

Rate-of-return (or cost-of-service) regulation

The regulatory tradition in the US is very different from that in Australia and the UK. In particular, utility operations tend to be privately owned rather than embedded in government departments, and have been subject to regulation by specific rate commissions rather than ‘internally’ by the department and Minister. The existing regulatory structure has been established over a long period of formal legal procedure dating back to the late nineteenth century. This type of approach has been little used in Australia.⁵

What has come to be known as rate-of-return regulation is a direct regulatory structure that places specific bounds on prices and profitability by allowing the regulated utility to cover its costs inclusive of a prescribed rate of return on capital. It is also known as cost-of-service regulation.

There are obvious weaknesses with the use of rate-of-return regulation as a form of control.

- ✍ Rate-of-return regulation tends to be interventionist with respect to the structure of pricing allowed, often placing direct constraints on individual prices. Resulting pricing structures often reflect political rather than economic imperatives.
- ✍ This form of regulation tends to be informationally demanding. There are inherent problems of gathering and interpreting the information on operational costs, capital value and WACC to make efficient decisions about the cost basis for allowed pricing. There is scope for a substantial amount of ‘gaming’ between the regulatory commission and the utility.
- ✍ Rate hearings occur on a frequent basis necessitating a large amount of effort on the part of the regulated utility and the regulatory body. At times of general inflation of costs and prices there can be difficulties of regulatory lag if rates are not adjusted frequently.⁶
- ✍ Rate-of-return regulation can lead to an incentive to overcapitalise. Where the allowed rate of return exceeds the cost of capital, the utility has an incentive to expand the base on which the return is reckoned and thereby increase profitability within the constraint. This is known as the Averch–Johnson effect after Averch and Johnson (1962).⁷ Broadening the base is a two-edged sword. While expansion of

5 A rare case of something like rate-of-return regulation was the system used in New South Wales to regulate the Australian Gas Light Company (AGL). This was administered by the Energy Authority of NSW under the *Gas and Electricity Act 1935 (amended)*. Albon and Kirby (1983) analyse its operation.

6 Johnson (1973) identifies a second kind of regulatory lag that acts more in favour of the utility in that it can keep the benefits of cost reductions from technological innovation until the next rate hearing.

7 For expositions of the Averch–Johnson effect see Berg and Tschirhart (1988, pp. 324–33) and Sherman (1989, chapters 7–9). Note that this overcapitalisation is different from the phenomenon of ‘gold-plating’ where capital equipment is acquired to be left idle (see Johnson 1973).

the base produces benefits to the utility in terms of higher profits as a given rate of return above the cost of capital is applied to a larger capital base, it also results in inefficiently high production costs because of the distortion of the choice between capital and labour inputs. The regulated utility would therefore expand the capital base until marginal benefit from base expansion is equal to the marginal cost from the input distortion.

Price and revenue capping — origins and objectives

The form of new regulation most often introduced in Australia has been some form of CPI-X price capping or revenue capping. The most interesting and longest lasting Australian application of price capping has been in telecommunications, dating back to 1989. Price capping is currently being considered for use in the electricity distribution industry in both Victoria and New South Wales.

Under price capping the utility is allowed to increase the weighted average of the prices of a basket of its services by no more than the increase in the CPI less a percentage amount, X. Physical quantities of each service are the weights used in determining the weighted average. Usually these are previous period weights. It is possible that not all services are included in the basket. In particular, services in competitive areas are often left out. There may be sub-baskets of services subject to specific restrictions. Revenue capping places a ceiling on overall revenue.

Price capping has both practical and theoretical underpinnings. CPI-X (RPI-X in the UK reflecting that country's use of a retail price index or RPI) was initially developed as a temporary control mechanism in the transition to full competition for use in UK telecommunications (Littlechild 1983). It has since applied in a range of industries in a number of countries. While Littlechild developed the practical basis of CPI-X, Vogelsang and Finsinger (1979) developed the theoretical underpinnings of price capping regulation.⁸

Kaufmann and Lowry (2000, fn. 10, p. 11) argue that the US 'actually has a longer history with this regulatory system' than does the UK. Similarly, Acton and Vogelsang (1989, p. 370) state that 'while appearing to be a British import, price caps are not new to Americans'. They state examples of in-principle suggestion and a practical example.

Price capping and revenue capping are quite different things. The first restricts the change in quantity-weighted average of prices; the second restricts the change in revenue. The latter does not have the same desirable efficiency properties as the former as it does not provide an incentive to lower prices and expand outputs.

There are four main objectives of CPI-X price capping.

✍ **Achieving greater productivity:** the utility has a strong incentive to pursue productivity improvements. Where it fails to achieve cost reductions consistent with X, its profits will fall. Further, as it can keep any cost savings above those reflected in X, at least in the regulatory period, it has an incentive to aim for greater cost reductions than are provided by productivity growth of X per cent.

⁸ Vickers and Yarrow (1988, section 4.4), Armstrong, Cowan and Vickers (1994, section 3.3) and Abraham (1994) provide excellent discussions.

- ✍ **Passing on productivity growth to customers** : CPI?X forces the utility to pass on the cost reductions (reflected in the set value of X) in lower prices to customers rather than let them through to higher profits.
- ✍ **Whittling away monopoly profit or existing cost-inefficiency**: where the utility commences regulation with above normal profits and/or existing cost inefficiency, X can be set above TFP growth in order to whittle these away. Indeed, the gradual elimination of above normal profits was the emphasis of Vogelsang and Finsinger in establishing the theoretical basis for this form of regulation.
- ✍ **Restructuring prices**: CPI?X allows the utility to restructure its pricing towards greater efficiency. As the cap applies to the weighted average of the utility's prices and not to specific prices, the utility is able to raise (at least relative to the CPI change) one or more of its prices if other prices are reduced sufficiently to satisfy the cap. When freed in this way, the pursuit of profitability will lead the utility to change its pricing structure towards a Ramsey–Boiteux configuration to exploit the more inelastic demands in keeping with the 'inverse elasticity rule'. The pursuit of profits means that the utility will have an incentive to move prices towards a more efficient configuration.

Implementation problems of CPI? X

Establishing the initial situation

At the time of the implementation of CPI? X there are many possible starting points that have relevance to the design of the regulatory regime to optimise on the achievement of its objectives. There are three main dimensions to the starting situation.

Extent of initial cost recovery

To what extent are the utility's costs covered by the revenues generated? Do revenues exceed total costs (above normal profits) or fall short of them?

The two elements in determining the utility's costs are operating costs (these are relatively straightforward) and capital cost (the subject of considerable controversy). Determining the capital cost requires establishing the WACC and the capital base to which the WACC is to be applied.⁹

The concept of the capital base, that has gained some acceptance in Australia, is depreciated optimised replacement cost (DORC). This requires determining how much it would cost to replace the productive capacity of the existing capital stock (as depreciated) using the best technology currently available.

The WACC is the sum of the weighted average of the expected rate of return on debt and the expected rate of return on equity capital. In its simplest form, without considering the tax shield on debt capital or any issues of dividend imputation, it can be written as:

$$\text{WACC} = r_e \frac{E}{E + D} + r_d \frac{D}{E + D}$$

where r_e is the expected rate of return on equity capital;

r_d is the expected rate of return on debt capital;

E is the market value of equity capital held by the firm;

D is the market value of debt capital held by the firm; and

$E+D$ is the total market value of assets of the firm.

Over the past decade calculation of the WACC has been the subject of a great deal of debate in regulatory submissions and proceedings in Australia and in other countries. While the expected rate of return on debt capital has remained relatively uncontroversial — with the regulator normally just using the rate of return on some

⁹ See ACCC (1999), chapters 5 and 6 for discussion of both.

stable government bond as a proxy — the same cannot be said of the rate of return on equity capital. Much of the initial WACC debate related to the appropriate method for calculating the expected rate of return on equity capital.

Although a relatively new method for calculating the rate of return on equity in US regulatory proceedings during the mid-1980s, the capital asset pricing model (CAPM) subsequently appears to have become the most popular method to use. Since the early to mid-1990s most regulatory bodies in Australia, the US, the UK and Canada have adopted CAPM in preference to such alternatives as the dividend growth model (DGM) and arbitrage pricing theory (APT).

In Australia the most significant recent debate has surrounded the effect of the dividend imputation system (introduced in 1987) upon the WACC. In the academic finance literature there appears to be no widely agreed treatment of dividend imputation, with opposing views offered by Officer (1994) and Brailsford and Davis (1995). It seems that the approach endorsed by Officer has become the more widely used approach by regulatory bodies in Australia.

Officer (1994) estimates the post-tax WACC by using the formula:

$$WACC = r_e \left[\frac{1 - T}{1 - \gamma} \right] + r_d (1 - T) \frac{D}{E + D}$$

where T is the effective tax rate, and

γ is the average rate of utilisation of tax credits, and this gamma variable (γ) takes into account the overall effect of dividend imputation on the entire market.

McCutcheon and Richardson (1999) provide a neat summary of Officer's so-called gamma model and the Brailsford and Davis model. In particular they point out the major differences between the two models.

- ✍ The Officer model uses average investment behaviour as a base, while the Brailsford and Davis model assumes that the tax rates apply to marginal investment.
- ✍ The Officer model is based upon an ad hoc approach and very little empirical evidence exists as to the proportion of imputation credits used by shareholders of firms.
- ✍ The Officer model may not be valid for organisations with dividend pay-out ratios of less than 100 per cent, while the Brailsford and Davis model can still be used in such instances.

When a utility's allowed rate of return exceeds WACC it is considered to be making above-normal profits, and vice versa if the rate of return is less than WACC.

Armstrong, Cowan and Vickers (1994, p. 183) note that '[at] first sight it might seem strange to emphasize the role of the cost of capital and the asset base when one of the

objectives of the RPI-X system is to escape the well-known inefficiencies of rate-of-return regulation. But each regulator has the duty to ensure the firm can finance its operations, and it is clear that regulators pay close attention to these issues when setting X ... '.

Extent of cost inefficiency

A utility may be operating at less than world's best practice, using too many inputs to produce its outputs after correcting for influences on its costs beyond the control of management. Attempts at determining whether there is cost inefficiency are described as benchmarking studies because they relate the utility's performance to some best-practice benchmark or yardstick. (These methods were reviewed in Performance measurement on p. 4.) When there is evidence of cost inefficiency relative to world's best practice, as is usually the case for Australian utilities, one of the objectives of regulation is to provide an incentive for the ultimate elimination of this excess cost.

Inefficiency of the structure of prices

A utility about to be subject to CPI-X may have an inefficient structure of prices for individual services (some too high and some too low) and customer access charges (usually they have too little a role in cost recovery). Pricing inefficiencies are commonly part of the starting point of CPI-X regulation and impinge importantly on basket design and coverage.

The setting of X

As indicated in the previous section, the setting of X is crucial. The roles of X are to ensure that productivity improvements are passed on and (in some interpretations) that existing above normal profits and cost inefficiencies are removed. Usually X is set to reflect expected growth in total factor productivity (TFP) based on past TFP growth, but perhaps with an eye to possible future developments affecting costs. It may also include an amount to eat into existing monopoly profits and/or existing cost inefficiency. X is reassessed at regular intervals, for example, every three years in Australian telecommunications.

The greater the X, the tighter is the constraint. Obviously the regulated utility would prefer a low X (allowing higher prices and profits) while customers would prefer a higher X (lower prices). But the setting of X also has to make reference to, on the one hand, the incentive for the utility to reduce its costs and, on the other, its need to cover its full costs.

The regulatory period (re-setting X) and the 'glide path'

CPI-X regulatory regimes do not involve setting X in concrete for all time. The value of X is reassessed towards the end of each discrete regulatory period, usually every three to five years.

Where the regulated utility had been able to increase its profitability over the period, there is prima facie evidence that X was too low, and this needs to be taken into account in setting the X for the next regulatory period. However, the regulator would need to distinguish between impacts on profitability that were within and beyond the utility's control.

On the other hand, if the utility was unable to cover all of its costs, it is possible that X had been set too high and, all things being equal, should be reduced in the next regulatory period. Again, a distinction should be made between controllable and uncontrollable influences.

There is considerable debate about the sharing of excess productivity gains between the utility and consumers. ORG (1998, p. 5) argues that while 'the ultimate objective will be to pass the benefits of efficiency improvements on to customers ... that by allowing the licensees to retain for a period the benefits ... they will be motivated to deliver greater efficiencies over the long term than otherwise'. The issue is also discussed at length by IPART (1999a).

The ACCC (1999, chapter 7) puts the issue in terms of a 'glide path' where benefits are reduced in the next regulatory period according to a predetermined schedule. Another approach, the 'P₀ adjustment', passes the entire efficiency gains on to consumers at the start of the next regulatory period.

Service quality

Improvements in financial viability that flow from cost reductions resulting from productivity improvements with the same service quality, unambiguously reflect efficiency gains. However, where cost reductions come at the expense of service quality there is a counteracting negative effect on welfare. Therefore productivity change and the overall financial result also have to be considered in the light of service quality. This gives rise to two issues.

- ✍ How much do consumers value quality of service? Are they prepared to trade off lower service quality for a lower price or are they prepared to pay more to ensure higher quality levels? This issue requires careful analysis but there are severe empirical difficulties in determining how much customers value service attributes.
- ✍ What is the best way of regulating service quality — the stick or the carrot? The usual approach is to establish penalties for failing to meet the required standards. An alternative, suggested by Kaufmann and Lowry (1998, pp. 47–52) involves 'well-designed quality incentives that further motivate utilities automatically to do the right thing and maintain service quality'.

Overall assessment

CPI? X clearly belongs to the group of 'incentive compatible' regulations and has clear advantages over previous direct regulatory structures used in Australia and the US-style rate-of-return regulation with respect to the incentives it provides the utility to

pursue pricing and operational efficiency. While it also has administrative and compliance advantages, these can be overstated. It requires very careful design and is far more informationally demanding than it is often depicted. In particular it requires careful investigation of the starting point for the regulation with respect to the existing degree of cost recovery (are there above normal profits?), the extent of cost inefficiency (by how much do the utility's costs deviate from international best-practice cost levels after taking into account factors in its operating environment beyond the control of management?) and the extent of inefficiency of the existing pricing structure. It is also necessary to determine the likely course of productivity growth, usually based on past performance but with a forward-looking perspective as well.

Yardstick regulation

Another form of incentive regulation is yardstick regulation suitable for the regulation of utilities with regional monopolies (as in electricity distribution). Also known as competition by comparison, yardstick regulation seeks to provide an incentive for utilities to strive for lower costs by inducing them to compete with one another for cost reductions.

In one form, prices allowed for each utility are related to that utility's costs and to the costs of the other utilities in other regions (Shleifer 1985; Weyman-Jones 1995). Abstracting from unassigned cost recovery and cost factors beyond the utility's control, imagine that each utility is able to set a price equal to the mean unit cost of all utilities in the group. This means that it has an incentive to lower its own costs — it is the 'residual claimant' of any excess of price over own unit cost. (Of course, reducing its own costs feeds through to a lower cost for the group and therefore to a lower price.)

There may be uncontrollable factors influencing costs in different areas such as network size, differences in the mix of residential and business customers, population density and terrain. In principle, the cost impact of these factors can be measured and taken into account through a system of handicaps. In practice this is very difficult.

- ✍ The evaluation of these cost advantages and disadvantages is an inexact but improving science. For example, London Economics in IPART (1999b, p. vi) cautions that 'DEA and productivity scores should not be used precisely'.
- ✍ Evaluating these exogenous factors will give rise to an incentive for strategic behaviour as each utility can gain from having handicap settings move in their favour.

Conclusions

Performance measurement and regulation are related

Measurement and regulation of the performance of utilities are related in various ways. Where reform is being contemplated, performance appraisal is an essential backdrop to determining the urgency of that reform and how much gain can be expected. International benchmarking comparisons are particularly important. Where a reform process is in place, performance measurement over time is essential in assessing the success of that process (including regulatory components) in producing better outcomes. In reference to the concerns of this paper, productivity measurement (including the influence of factors external to the utility's management) is also an essential input to the devising of both price capping and yardstick regulatory regimes.

Performance measurement is difficult but advancing

There is not one special performance indicator — performance has many facets. As Waters and Street (1998, p. 357) argue, 'it is important to monitor both TFP and financial performance' and on their own they can be misleading. Furthermore, measuring outputs and inputs is difficult and different types of approaches can give markedly different results. There is a growing amount of increasingly sophisticated work on performance measurement techniques and application but the authors of these studies are quick to emphasise its limitations. This work is reviewed and evaluated in this paper, especially in relation to the electricity industry. However, it was not the purpose of this paper to arrive at definitive answers on this issue.

Pricing structure is important

The ability of the regulated utility to establish a more efficient (and transitorily more profitable) pricing structure is an important aspect of the incentive compatibility of CPI-X price capping. However, the inefficiency of existing pricing structures has been given too little prominence in the discussion of different regulatory arrangements for electricity distribution and the potential enhancing properties of pricing efficiency of CPI-X price capping have all but been ignored in the debate.

Not all regulation is incentive regulation

Regulation is incentive compatible when it provides the incentive for the utility to pursue cost efficiency and pricing efficiency. Rate-of-return regulation fails on both counts — it actually encourages the regulated utility to adopt inefficient production processes with excessive use of capital and prevents the utility from moving to more efficient pricing structures. On the other hand, both CPI-X and yardstick regulation can be devised so as to provide the right incentives for pursuit of both cost efficiency and pricing efficiency. As noted by Rees and Vickers (1995, p. 367):

A notable feature of price-cap regulation in Britain is that regulated firms have been given more discretion ... [over relative prices] than ... US utilities subject to traditional rate-of-return regulation.

There is no sense in which all regulation is incentive regulation. Stephen King's argument that rate of return and CPI-X are 'in effect' the same, is based on a simplistic model where there is only one factor (and therefore cannot encompass distortion of the input choice) and only one price (and therefore cannot encompass pricing structure considerations). This model is irrelevant to the essence of the debate.

Cap prices not revenue

The relevant theoretical literature suggests that efficient regulatory design requires the use of CPI-X price capping (capping the weighted average of prices using previous period quantity weights), rather than revenue capping regulation. The latter does not provide an incentive for growing markets. The distinction between the two is not always clear in this debate, including in the work of the ACCC (1999, p. 96).

Importance of X

The selection of X is important because it involves many facets, especially TFP growth, forward-looking considerations specific to the regulated utility, the extent of existing above normal profit at the commencement of regulation and the existing excess use of factors of production (cost inefficiency). X must be set just right: low enough to make the utility hungry for efficiency gains and not so high as to preclude full cost recovery. And where targets are set using X, these should be based on the ultimate achievement of world's best practice, not some more local benchmark.

Timing of regulatory re-sets is important

While rate-of-return regulation is based on negotiated timing of rate reviews, CPI-X is based on set time periods, usually of three to five years. It is important that there is a high degree of certainty about the regulatory parameters and the period between reviews — essentially the regulator should be 'invisible' between reviews. Appropriate sharing arrangements must be built into the regulatory structure.

WACC and DORC are difficult to avoid

X can be determined either through studying TFP or through the building blocks approach, but in practice WACC and DORC have to be determined whichever approach is taken. Suppose X is determined on the basis of TFP change. In this case, successful regulation requires determination of the starting point situation with respect to cost recovery, and this can only be determined by estimating DORC and WACC. Where X is determined after building up costs, DORC and WACC are essential building blocks. DORC and WACC have proved very controversial in past regulatory determinations including in telecommunications and water.

Yardstick regulation is informationally demanding

In common with other regulatory structures, yardstick regulation requires starting point information about the relativity of revenues to costs and industry-wide TFP growth estimates. In addition, successful implementation requires that the regulatory body sort out which cost factors are beyond the control of management, and this requires detailed knowledge of the particular cost circumstances of the various utilities in the yardstick pool and the application of appropriate techniques. After all this, the results must be used with caution.

References

- Abbott, M. 1999, 'Productivity and efficiency measurement of public utilities', paper prepared for the Utility Regulators Forum, 17 November.
- Abraham, D. 1994, An analysis of price cap regulation and its application in Australian telecommunications, PhD thesis, Department of Economics, Australian National University, January.
- Acton, J. and Finsinger, I. 1989, 'Introduction (to symposium on price-cap regulation)', *Rand Journal of Economics*, 20, 3, pp. 369–72.
- Albon, R. and Kirby, M. 1983, 'Cost-padding in profit-regulated firms', *Economic Record*, 59, 164, March, pp. 16–27.
- Armstrong, M., Cowan, S. and Vickers, J. 1994, *Regulatory Reform: Economic analysis and British experience*, MIT Press, Cambridge, Mass. and London.
- Australian Competition and Consumer Commission 1999, *Statement of Principles for the Regulation of Transmission Revenues* (draft), Canberra, 27 May.
- Averch, H. and Johnson, L. 1962, 'Behaviour of the firm under regulatory constraint', *American Economic Review*, 52, 5, pp. 1052–69.
- Baumol, W. 1995, 'Modified regulation of telecommunications and the public-interest standard' in *The Regulatory Challenge*, edited by Bishop, M., Kay, J. and Mayer, C., Oxford University Press, New York, pp. 254–82.
- Baumol, W. and Bradford, D. 1970, 'Optimal departures from marginal cost pricing', *American Economic Review*, 60, 3, June, pp. 265–83.
- Berg, S. and Tschirhart, J. 1988, *Natural Monopoly Regulation Principles and Practice*, Cambridge University Press.
- Bernstein, J. and Sappington, D. 1988, 'How to determine X in RPI? X regulation: a user's guide', publication details unknown.
- Bollard, A. E. and Pickford, M. 1995, 'New Zealand's 'light-handed' approach to utility regulation', *Agenda*, 2, 4, pp. 411–22.
- Brailsford, T. and Davis, K. 1995, 'Valuation with imputation: what it means to the cost of capital', *JASSA*, 1, pp. 14–18.
- Bureau of Industry Economics 1995, *International Benchmarking Overview 1995*, Report No. 95/20, AGPS, Canberra, November.
- Bureau of Industry Economics 1996, *Electricity 1996: International Benchmarking*, Report No. 96/16, AGPS, Canberra.

- Independent Committee of Inquiry 1993, *National Competition Policy* (Hilmer report) AGPS, Canberra.
- Crew, M. and Kleindorfer, P. 1996, 'Incentive regulation in the United Kingdom and the United States: some lessons', *Journal of Regulatory Economics*, 9, pp. 211–25.
- Independent Pricing and Regulatory Commission (ACT) 1999, 'ACTEW's electricity, water & sewerage charges for 1999/2000 to 2003/2004', Price Direction, Canberra, May.
- Independent Pricing and Regulatory Tribunal of NSW 1999a, 'Regulation of electricity network service providers incentives and principles for regulation', Discussion Paper DP-32, January.
- Independent Pricing and Regulatory Tribunal of NSW (London Economics) 1999b, 'Efficiency and benchmarking study of the NSW distribution businesses', Discussion Paper No. 13, February.
- Independent Pricing and Regulatory Tribunal of NSW (Roger Carrington) 1999c, 'Benchmarking the efficiency of Australian gas distributors', Research Paper, December.
- Industry Commission 1997, 'Telecommunications economics and policy issues', Staff Information Paper, Canberra.
- Johnson, L. 1973, 'Behaviour of the firm under regulatory constraint: a reassessment', *American Economic Review*, 63, 2, pp. 90–7.
- Kaufmann, L. and Lowry, M. 1998, 'Review of distribution price controls in Victoria: comments on NERA's proposed approach and the Regulator-General's consultation paper', Laurits R. Christensen Associates Inc., Madison, Wisconsin, September.
- Kaufmann, L. and Lowry, M. 2000, 'Independent benchmarks and effective utility regulation', Pacific Economics Group, Madison, Wisconsin.
- King, S. and Maddock, R. 1996, *Unlocking the Infrastructure: The Reform of Public Utilities in Australia*, Allen & Unwin, Sydney.
- King, S. 1999, 'Incentive regulation in Australia — a hybrid approach?', ACCC incentive regulation conference, Sydney, November.
- Kirby, M. 1986, 'Airline economies of 'scale' and Australian domestic airline policy', *Journal of Transport Economics and Policy*, 20, 3, September, pp. 339–52.
- Kirby, M. and Albon, R. 1985, 'Property rights, regulation and efficiency: a further comment on Australia's two-airline policy', *Economic Record*, 61, 173, June, pp. 535–9.
- Lawrence, D. 1998, discussion of Peter Forsyth's paper in *Microeconomic Reform and Productivity Growth*, workshop proceedings, Productivity Commission, pp. 301–6.

- Littlechild, S. 1983, *Regulation of British Telecommunications' Profitability*, HMSO, London.
- McCutcheon, M. and Richardson, L. 1999, 'Estimating a WACC for Telstra's USO services', Communications Research Unit working paper, Department of Communications, Information Technology and the Arts, Canberra, April.
- Makholm, J. 1999, 'Benchmarking, rate cases and regulatory commitment', ACCC incentive regulation conference, Sydney, November.
- National Economic Research Associates (NERA) 1996, *Techniques for measuring comparative economic efficiency of utilities in Victoria*, a report for the Office of the Regulator-General, Victoria, London, June.
- Office of the Regulator-General, Victoria 1998, '2001 Electricity distribution price review: framework and approach', Consultation Paper No. 1, Melbourne, June.
- Office of Water Regulation 1999, 'Best practice utility regulation', prepared for the Utility Regulators Forum, July.
- Officer, R. 1994, 'The cost of capital of a company under an imputation system', *Accounting and Finance*, 34, 1, pp. 1–18.
- Productivity Commission 1998a, *Performance of Government Trading Enterprises 1991/92 to 1996/97*, Research Report, AusInfo, Canberra, October.
- Productivity Commission 1998b, 'Rate of return issues', Commonwealth Competitive Neutrality Complaints Office Research Paper, Canberra, December.
- Productivity Commission 1999, *International Benchmarking of Australian Telecommunications Services*, Research Report, AusInfo, Melbourne, March.
- Rees, R. and Vickers, J. 1995 'RPI? X price cap regulation' in *The Regulatory Challenge*, edited by Bishop, M., Kay, J. and Mayer, C., Oxford University Press, Oxford, chapter 15.
- Sherman, R. 1989, *The Regulation of Monopoly*, Cambridge University Press, Cambridge.
- Shleifer, A. 1985, 'A theory of yardstick competition', *Rand Journal of Economics*, 16, pp. 319–27.
- Shuttleworth, G. 1998, *Updating Price Controls: Rationale and Practicalities*, a report to the Office of the Regulator-General, National Economic Research Associates, London, June.
- Shuttleworth, G. 1999, 'Regulatory benchmarking: a way forward or a dead-end?', Energy Regulation Brief, National Economic Research Associates, London.
- Steering Committee on National Performance Monitoring of Government Trading Enterprises 1994, *Guidelines on Accounting Policy for Valuation of Assets of*
-

Government Trading Enterprises: Using Current Valuation Methods, Industry Commission, October.

Vickers, J. and Yarrow, G. 1988, *Privatization: An Economic Analysis*, MIT Press, Cambridge, Mass.

Vogelsang, I. and Finsinger, J. 1979, 'A regulatory adjustment process for optimal pricing by multiproduct monopoly firms', *Bell Journal of Economics*, 10, 1, Spring, pp. 157–71.

Weyman-Jones, T. 1995, 'Problems of yardstick regulation in electricity distribution' in *The Regulatory Challenge*, edited by Bishop, M., Kay, J. and Mayer, C., Oxford University Press, Oxford, chapter 18.

Waters, W. and Street, J. 1998, 'Monitoring the performance of government trading enterprises', *Australian Economic Review*, 31, 4, December, pp. 357–71.

Zeitsch, J., Lawrence, D. and Salerian, J. 1994, 'Comparing like with like in productivity studies: apples, oranges and electricity', *Economic Record*, 70, 209, June, pp. 162–70.

Contacts

ACCC	Regulators Forum issues	Mr Joe Dimasi	(03) 9290 1814
	Newsletter	Mrs Katrina Huntington	(03) 9290 1915
	Telecommunications	Mr Michael Cosgrave	(03) 9290 1914
	Airports	Ms Margaret Arblaster	(03) 9290 1862
	Electricity	Mr Michael Rawstron	(02) 6243 1249
	Gas	Ms Kanwaljit Kaur	(02) 6243 1259
		http://www.accc.gov.au	
NSW	IPART	Professor Tom Parry	(02) 9290 8411
		http://www.ipart.nsw.gov.au	
VIC	ORG	Dr John Tamblyn	(03) 9651 0223
		http://www.reggen.vic.gov.au	
TAS	Govt Prices Oversight Commission	Mr Andrew Reeves	(03) 6233 5665
			http://www.gpoc.tas.gov.au
	Office of the Tasmanian Electricity Regulator	Mr Andrew Reeves	(03) 6223 5665
		http://www.electricityregulator.tas.gov.au	
QLD	Queensland Competition Authority	Mr John Hall	(07) 3222 0500
		http://www.qca.org.au	
WA	Office for the Gas Access Regulator	Dr Ken Michael	(08) 9213 1900
			http://www.offgar.wa.gov.au
	Office of Water Regulation	Dr Brian Martin	(08) 9213 0100
		http://www.wrc.wa.gov.au/owr	
SA	SA Independent Pricing and Access Regulator (SAIPAR)	Mr Graham Scott	(08) 8226 5788
			http://www.saipar.sa.gov.au
	SA Independent Industry Regulator (SAIIR)	Mr Lew Owens	(08) 8463 4450
		http://saiir.sa.gov.au	
NT	Utilities Commission	Mr Alan Tregilgas	(08) 8999 5480
		http://www.utilicom.nt.gov.au	
ACT	Independent Competition and Regulatory Commission (ICRC)	Mr Paul Baxter	(02) 6205 0799
		http://www.icrc@act.gov.au	